What is claimed is:

1. A method of manipulating a particle using a beam of laser light, comprising the steps of:

providing a beam of laser light;

focusing the beam of laser light to establish a plurality of optical traps;

converting the plurality of optical traps into an optical vortex; and

trapping a plurality of particles within the optical vortex, the optical vortex applying a torque to the plurality of particles.

2. The method of claim 1, wherein the plurality of particles are trapped within the optical vortex using a plurality of computer-generated diffractive optical elements

3. The method of claim 2, wherein the torque results in a spinning action of the plurality of particles about its axis.

4. The method of claim 3, wherein s plurality of particles are trapped along the periphery of the optical vortex, each of the plurality of particles spinning along their own respective axis.

5. The method of claim 4, wherein the plurality of particles rotate around the center of the optical vortex.

6. The method of claim 5, wherein a plurality of optical vortices are formed from the plurality of optical traps, and wherein a plurality of particles rotate about each of the plurality optical vortices.

7. The method of claim 6, each of the plurality of optical vortices include alternating topical charges, and further comprising the step of alternately activating and deactivating the plurality of optical vortices depending upon the topical charge of each optical vortex.

8. The method of claim 6, wherein the rotation of the plurality of particles about the plurality of optical vortices results in a particular flow pattern for a fluid passing through the plurality of optical vortices.

9. The method of claim 1, wherein the trapping action is accomplished using optical forces represented by the algorithm $\alpha_j^{(n+1)} = \left[(1-a) + a\frac{\alpha_j}{\alpha_j^{(n)}}\right]\alpha_j$.

10. The method of claim 6, further comprising step of using a computer addressable spatial light modulator to reconfigure the plurality of optical vortices.

11. A method of pumping a fluid through a channel in accordance with a predetermined flow pattern, comprising the steps of:

providing a beam of laser light;

focusing the beam of laser light to establish a plurality of optical tweezers;

converting the plurality of optical tweezers into a plurality of optical vortices using a computer-generated diffractive optical elements

trapping a plurality of particles within the each of the plurality of optical vortices, the plurality of particles spinning about their own respective axis and rotating about the nearest optical vortex; and

flowing a fluid through a channel containing the plurality of optical vortices, the fluid being pumped by at least one of the spinning and rotation of the plurality of particles.

12. The method of claim 11, wherein each of the plurality of optical vortices are alternately activated and deactivated according to a predetermined pattern.

13. The method of claim 12, wherein each of the plurality of optical vortices are alternately activated and deactivated according to a plurality of predetermined patterns.

14. The method of claim 13, wherein the each of the plurality of optical vortices includes one of a positive charge and a negative charge.

15. The method of claim 14, wherein the positive and negative charges of the plurality of optical vortices are used to fractionate components of the fluid as the fluid passes through the channel.

16. A system for manipulating a fluid, comprising:

means for forming a plurality of optical vortices using a computer-generated diffractive optical element with a focused beam of laser light to form a plurality of optical traps; and

a plurality of particles positioned about a rim of each of the plurality of optical vortices, each of the plurality of particles spinning about its respective axis and rotating about the respective optical vortex,

wherein the spinning and rotating plurality of particles pumps a fluid through a region including the plurality of optical vortices.

17. The apparatus of claim 16, further comprising means for selectively activating and deactivating each of the plurality of optical vortices, the selective activation and deactivation of the plurality of optical vortices altering the degree of spinning and rotation of the plurality of particles about each of the plurality of optical vortices.

18. The apparatus of claim 17, wherein the selective activation and deactivation of each of the plurality of optical vortices forms a particular pattern for pumping and mixing the fluid.

19. The apparatus of claim 17, wherein each of the plurality of optical vortices include at least one of a positive charge and a negative charge.

20. The apparatus of claim 19, wherein the positively charged and negatively charged optical vortices cooperate to fractionate particles entrained within the fluid.

21. A method for manipulating a material using a micromachine, comprising:

providing a beam of laser light;

forming a plurality of optical traps from the beam of laser light;

converting the plurality of optical traps into a plurality of optical vortices; and

trapping a portion of the material within the optical vortices, the optical vortices applying a torque to the material.

22. The method of claim 22, wherein the torque results in a spinning of the portion of the material trapped by the plurality of optical vortices.

23. The method of claim 23, wherein the portion of the material trapped by the plurality optical vortices rotates about the nearest optical vortex.

24. The method of claim 23, wherein a computer generated diffractive optical element converts the plurality of optical traps into a plurality of optical vortices.